

**Applicant:** Lee et al.  
**Application No.:** 10/617,335

**Amendments to Drawings:**

In Fig. 4, new reference numerals for the three capacitors, C<sub>1</sub>, C<sub>2</sub>, and C<sub>3</sub>, are added (C<sub>1</sub> and C<sub>2</sub> are bulk capacitors for the half-bridge circuit and C<sub>3</sub> is a resonant capacitor for the resonant LC circuit, which all are elements of the ballast circuit known in the prior art) according to the esteemed examiner's opinions.

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**REMARKS/ARGUMENTS**

Claims 2, 7, and 8 are amended to correct informalities, Fig. 4 is modified to show the reference numerals of the three capacitors, and the specification of the present invention is amended to include the descriptions regarding the unmentioned reference numerals, R<sub>1</sub>, R<sub>2</sub>, V<sub>ref</sub>, C<sub>1</sub>, C<sub>2</sub>, and C<sub>3</sub>, according to the esteemed examiner's comments. These modifications either can find support from the original version of the specification or are known to one with the ordinary skill in the field and are employed to clarify the contents of the application. Thus, the above-mentioned amendment of the claims, corrected drawing of Fig. 4, and modifications of the specification do not contain any new matter.

The esteemed examiner addressed that the (previous presented) corrected drawing of Fig. 4 is objected to since the reference character(s), R<sub>1</sub>, R<sub>2</sub> and the three capacitors connected to the lamp and the inverter are not mentioned in the description, and corrected drawing sheets, or amendment to the specification to add the reference character(s) in the description are required. Fig. 4 and the specification of the present invention are modified accordingly as above-mentioned.

The esteemed examiner commented that Claims 2 and 7-8 are objected to because of the informalities included. Claims 2 and 7-8 are amended according to the esteemed examiner's comments as aforementioned.

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In considering the patentability of the claims under 35 U.S.C. 103(a), the esteemed examiner presumed that the subject matter of the various claims of the present invention was commonly owned. Again, yes, the joint inventors of the present invention commonly do own the subject matter of the various claims.

The esteemed examiner commented that Claims 1-4, and 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trestman et al. (U.S. Patent No. 6,680,585) in view of Spira et al. (U.S. Patent No. 3,731,142).

Regarding Claim 1, the esteemed examiner pointed out that a frequency-modulated dimming control system of a discharge lamp comprising a ballast circuit, which comprises a rectifier, a voltage converter, and a control integrated circuit, has been disclosed in Fig. 3 of the '585 Patent, but a voltage regulator is not disclosed, and a frequency-modulated dimming control system of a discharge lamp including a ballast circuit, which includes a voltage regulator, is disclosed in Fig. 13 of the '142 Patent.

After reviewing the '585 Patent and the '142 Patent, the applicants respectfully submit that the claimed invention is patentable over the '585 Patent in view of the '142 Patent due to the following differences and advantages:

1. The output of the voltage converter of the present invention is a dimming signal, but the output of the “voltage converter” (including R1, R2, R3, R5, C3, Vref,

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and EA according to the esteemed examiner's opinions) as shown in Fig. 3 of the '585 Patent is not.

In the present invention, the dimming signal is produced by the voltage converter of the ballast circuit for controlling the output of the discharge lamp so as to control the light intensity of the discharge lamp. One with ordinary skill in the field would know that the output of the discharge lamp is variable since the same is controlled by the dimming signal according to Claim 1. But in the '585 Patent, the output of the EA of the "voltage converter" is employed to keep the inverter input current constant such that the power consumption of the inverter would stay constant due to the constant voltage on the inverter input and the constant efficiency (see column 4, lines 50-57 of the '585 Patent). One with ordinary skill in the field would know that the output of the EA of the "voltage converter" of the '585 Patent is not a dimming signal for controlling the intensity of the discharge lamp due to the fact that the output of the discharge lamp (the power consumption of the inverter) is constant. Thus, the output of the voltage converter of the ballast circuit of the present invention is different from that of the '585 Patent. By the same token, the output of the proposed voltage converter of the ballast circuit being a dimming signal is not anticipated/taught/disclosed by the '585 Patent.

2. The frequency modulation employed in the ballast system of the present invention is employed for providing a current to the discharge lamp so as to control the light intensity of the discharge lamp, but the frequency modulation in the ballast system of the '585 Patent is employed for eliminating the deleterious effects of the lamp's acoustic resonance.

In the present invention, a current is provided to the discharge lamp in response to a frequency modulation of the ballast circuit and the variation of the bus voltage so as to control a light intensity of the discharge lamp according to Claim 1. But in the '585 Patent, the frequency modulation of the output AC current is provided to eliminate the deleterious effects of the lamp's acoustic resonance, and the voltage ripple on the bulk capacitor of the PFC output (DC bus) is used for frequency modulation (see column 3, lines 2-9). Thus, the purposes and functions of the frequency modulation of the present invention are different from those of the '585 Patent. Accordingly, the frequency modulation, which is employed in the ballast circuit of the present invention to control the light intensity of the discharge lamp, are not anticipated/disclosed/suggested by the '585 Patent.

3. In the present invention, the level of the output voltage of the voltage regulator is a predetermined ratio of the input voltage, but the output voltage of the "voltage regulator" of the '142 Patent is not.

The proposed voltage regulator of the present invention has a variable output voltage for converting an input voltage into a bus voltage, and the level of the bus voltage is a predetermined ratio of the input voltage according to Claim 1 (e.g., 10% according to Claim 4). As for the “voltage regulator” disclosed in the ‘142 Patent (a variable transformer 82 and an isolation transformer 83 as shown in Fig. 13 according to the esteemed examiner), the input voltage of the variable transformer 82 is a 120 volts, 60 cycles AC source, and the output voltage of the variable transformer 82 is variable between 0 to 140 volts and connected to the isolation transformer 83 without any predetermined ratio of the input voltage mentioned (see column 6, lines 31-39 of the ‘142 Patent). That is to say, though the output voltage of the variable transformer 82 of the ‘142 Patent is variable between 0 to 140 volts and (for example) one could argue that those values of 0 to 140 volts vs. 120 volts would imply (such as) “any ratio” of the ratios between 0% to 116.7%, no predetermined ratio (say 10%) is anticipated/disclosed/suggested in the ‘142 Patent. One with an ordinary skill would know, that the level of the bus voltage generated from the proposed voltage regulator of the present invention is desired to be a predetermined ratio of the input voltage due to the requirements of the dimming control of the discharge lamp. On the contrary, the ‘142 Patent is not contemplated for the purpose of the dimming control of the discharge lamp. Though the output voltage of the variable transformer 82 of the ‘142 Patent is variable between 0 to

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140 volts, contrary to what has been indicated by the esteemed examiner, there is not any predetermined ratio mentioned in column 6, lines 32-40, of the '142 Patent. Thus, the output voltage of the voltage regulator being a predetermined ratio of the input voltage in the proposed dimming control system of the present invention could not be anticipated/taught/suggested by the '142 Patent.

4. Although it is not proper to compare the present invention with the '585 Patent in view of the '142 Patent due to the fact that the applications/purposes/functions of the proposed dimming control system/voltage converter/ballast circuit of the present invention are different from those of the '585 Patent in view of the '142 Patent, the advantages of the proposed dimming control system of the present invention over the '585 Patent in view of the '142 Patent are addressed below so as to elaborate the truth that the present invention is patentable. Firstly, the total manufacturing costs of the present invention would be lower and the reliability would be higher than those of the '585 Patent in view of the '142 Patent due to the relatively simpler configuration and less components included in the proposed voltage converter and inverter (for example) of the preferred embodiment of the present invention than those of the '585 Patent. Specifically, there are four components,  $R_1$ ,  $R_2$ ,  $V_{ref}$ , and OP Amp, included in the proposed voltage converter of the present invention (not included in Claim 1, but included in the previous presented "corrected drawing of Fig. 4" according to the

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esteemed examiner's opinions), but on the contrary, there are 7 components (R1, R2, R3, R5, C3, Vref, and EA) included in the "voltage converter" of '585 Patent as mentioned above. Secondly, the inverter (36) of the present invention includes two switches (361 as shown in Fig. 4) and the resonant LC circuit of the same includes the inductor (38) and the resonant capacitor C<sub>3</sub>, but on the contrary, the inverter (4) of the '585 Patent includes two switches (S1 and S2), one transformer (T1), and two capacitors (C4 and C5). Thirdly, except for the two switches (361 vs. S1 and S2) included in the inverter (36 vs. 4), the transformer T1, and the two capacitors, C4 and C5, of the '585 Patent are rather complex in configuration and more expensive in manufacturing costs than the inductor (38) and the resonant capacitor C<sub>3</sub> of the resonant LC circuit of the present invention. Thus, the relatively lower manufacturing costs and higher reliability due to the simpler configuration and less components included in the proposed dimming control system of the present invention than those of the '585 Patent are surely the advantages of the present invention over the '585 Patent in view of the '142 Patent to the least extent accordingly. Lastly, the novelty of the present invention over the '585 Patent in view of the '142 Patent is elaborated in detail according to the aforementioned descriptions.

According to the above-mentioned descriptions, one could draw a conclusion that Claim 1 of the present invention is patentable over the '585 Patent in view of

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the '142 Patent.

Claims 2-4, and 6-10 are dependent claims of Claim 1.

The Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. 102 and 103.

In conclusion, the Applicants respectfully submit that none of the references cited by the Examiner, renders Claims 1-4, and 6-10 anticipated or obvious. The present invention is patentable over the cited references, and reconsideration and allowance of the present patent application are earnestly solicited at an early date.

**Conclusion**

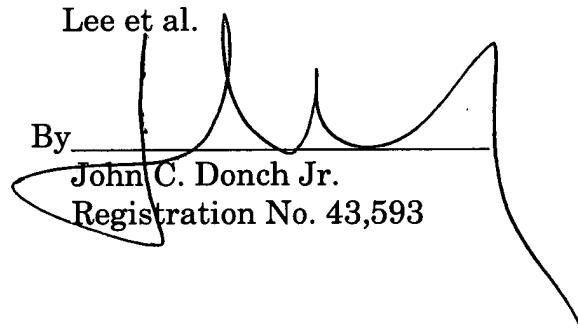
If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

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In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1 - 4 and 6 - 10, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

Lee et al.  
By \_\_\_\_\_  
John C. Donch Jr.  
Registration No. 43,593



Volpe and Koenig, P.C.  
United Plaza, Suite 1600  
30 South 17th Street  
Philadelphia, PA 19103  
Telephone: (215) 568-6400  
Facsimile: (215) 568-6499

JCD/dmr  
Enclosure